Folliculitis Keloidalis Nuchae and Pseudofolliculitis Barbae Are Prevention and Effective Treatment Within Reach?

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INTRODUCTION

Pseudofolliculitis barbae (PFB) and folliculitis keloidalis nuchae (FKN) are chronic follicular disorders that disproportionately affect men of African ancestry. Though common, these conditions are often therapeutically challenging, requiring pharmacologic, procedural, and behavioral approaches to treatment. In this article the epidemiology, pathogenesis, clinical findings, treatment options, prevention, and new advances with regard to PFB and FKN are discussed. The possibility of achieving effective preventive measures and treatments is also explored.

PSEUDOFOLLCULITIS BARBAE

Epidemiology

PFB is a common follicular disorder most prevalent in men of African ancestry.¹⁻³ It is also frequently observed among Hispanic, Middle Eastern, and other populations in whom tightly curled hair is common. Among African American men, the incidence of PFB is 45% to 83%.⁴⁻⁶

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PFB may also occur in any race and may also affect women.\textsuperscript{1,7,8}

\textbf{Pathogenesis}

PFB is a chronic, noninfectious inflammatory disorder resulting from a foreign-body reaction to the hair shaft. Individuals who have coarse, tightly curled hair and who shave are predisposed to this condition, owing to the tendency for the distal portion of tightly curled hair shafts to reenter the skin after shaving. Reentry of shaved hair shafts can occur through 1 of 2 mechanisms: (1) extrafollicular penetration, whereby the shaved hair shaft grows along its natural curvature and penetrates the epidermis 1 to 2 mm distal to the follicular opening; or (2) transfollicular penetration, whereby the sharp distal tip of a shaved hair shaft retracts beneath the skin surface, pierces the follicular wall, and enters the dermis. Stretching the skin during shaving or close shaving techniques can contribute to transfollicular penetration.\textsuperscript{4,9,10}

Hair reentry (via either extrafollicular or transfollicular penetration) results in a chronic, foreign-body inflammatory response.\textsuperscript{1} In addition to this mechanical etiology, a genetic risk factor has been identified that can affect a subset of men with PFB. A substitution mutation in the 1A $\alpha$-helical segment of the hair-follicle–specific keratin 75 (formerly K6hf) was found in 36\% of PFB cases compared with 9\% in controls ($P<.000006$). This single nucleotide polymorphism may be associated with a structurally weakened companion layer of the hair follicle which, along with curly hair shafts and close shaving, contributes to an increased risk for PFB.\textsuperscript{11}

\textbf{Clinical Features}

The clinical hallmarks of PFB are follicular and/or perifollicular papules in an area where repetitive shaving has occurred (Fig. 1). In men, the most commonly affected area is the neck (Fig. 2) followed by the cheeks, whereas in women the chin (especially the submental region) is the most commonly affected area.\textsuperscript{3} Of note, the moustache and nuchal areas are rarely affected. Hirsute women who shave or pluck unwanted hairs frequently develop PFB on the chin and neck area (Fig. 3). Shaving the axillae and bikini region of the groin, a common practice among women of all races, can lead to pseudofolliculitis in these areas.\textsuperscript{7}

The papules of PFB may be firm, skin colored, erythematous, or hyperpigmented. If secondary infection arises, pustules and papulopustules may be present.\textsuperscript{3} Some papules may contain visible hairs.\textsuperscript{3} Linear depressions in the affected skin areas likely represent hairs that are growing parallel to the surface of the skin (Fig. 4).\textsuperscript{4} Potential sequelae include postinflammatory hyperpigmentation (PIH) and keloids.\textsuperscript{1} Pruritus and pain are also potential associated clinical features.\textsuperscript{3,8}

The differential diagnosis of PFB includes acne vulgaris, sycois barbae, and traumatic folliculitis. No comedonal lesions are found in PFB, and acne vulgaris affects other areas of the face in addition to the beard area. Pustules are common in acne vulgaris, whereas they are rare in PFB. In sycosis barbae, perifollicular pustules are the primary and predominant lesions. Lesions in PFB are isolated, whereas in sycosis barbae they are confluent. Shaving improves sycosis barbae, whereas it makes PFB worse. Traumatic folliculitis, commonly known as razor burn, occurs when shaving is done too closely. Lesions are erythematous, painful, small follicular papules, which disappear within 24 to 48 hours after shaving.
Pseudofolliculitis barbae persists for several weeks after cessation of shaving.

**Management**

The goal of PFB management is to improve the cosmetic appearance of the affected area, enhance one’s self-esteem, appropriately address impacts of PFB on occupational requirements, and prevent further complications such as hypertrophic scarring, keloidal scarring, or infection.

Setting reasonable expectations regarding potential treatment outcomes is a priority. PFB is a chronic problem for which the only true cure is growing a beard or having the hairs permanently removed.\(^1\)\(^2\)

Many patients are disturbed by the appearance of PFB lesions. Not only do these lesions potentially impact self-esteem, they may also lead to an inability to comply with workplace grooming policies. Men working in jobs requiring a close-shaven appearance may experience personal distress, along with repercussions from employers. Occupations such as flight attendant, police officer, and food service worker often require a close shave. African Americans in the military are often forced to choose between worsening their PFB with close shaves or be at risk for discharge from the armed forces.\(^3\)\(^,\)\(^4\)\(^,\)\(^5\)\(^,\)\(^1\)\(^3\)\(^,\)\(^1\)\(^4\)

Treatment options for PFB are summarized in **Table 1**. The initial consultation for a patient with PFB should begin with a detailed discussion of therapeutic options and can involve a stepwise approach (Fig. 5). The first step is offering the patient the option of growing a beard, as discontinuation of shaving for at least 1 month has been shown to be curative in most cases. Patients who choose this option may require a physician letter for their employer to permit them to maintain a well-groomed beard in their professional setting.

For patients who prefer not to have a beard, recommendations are directed toward minimization of hair shaft reentry and reduction of inflammation. Modification of shaving practices, including the addition of preshave and postshave regimens, is helpful in achieving these goals. Before shaving, the beard area should be prepped by washing with warm water and a mild soap-free cleanser. Using a wash cloth or polyester cleansing pad in a circular motion is a helpful technique aimed at gently releasing embedded hair shafts before shaving. Preshave washing regimens (using a scrub or brush) have been shown to reduce the percentage of trapped beard hairs.\(^1\)\(^5\) Shaving should be performed with a clean, sharp razor with the skin in its relaxed state (stretching of the skin should be avoided, as this may facilitate transfollicular penetration of hairs shaved slightly below the skin surface). Shaving in the direction of hair growth (ie, with the grain) has been generally recommended\(^4\); however, a recently published study found that men who reported shaving against the grain had lower papule counts.\(^1\)\(^6\) Traditionally, single-blade razors have been favored over multiple-blade razors because of concerns about transfollicular penetration associated with the closer shave achieved with multiple-blade razors. However, in a recent study, PFB was not exacerbated by the use of multiple-blade razors (in conjunction with a preshave cleanser and postshave lotion).\(^1\)\(^6\) Regardless of choice of a single-blade or multiple-blade razor, a clean, sharp razor blade should be used for each and every shave. Published comparative studies of single-blade versus multiple-blade razors or electric versus manual razors in patients with PFB are currently lacking, as are studies that

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**Fig. 3.** Pseudofolliculitis barbae involving the chin and submental region in a woman with hirsutism who tweezed and shaved unwanted hairs.

**Fig. 4.** Severe pseudofolliculitis barbae involving the neck. Note coarse hair shafts growing tangentially on the upper third of the neck.
prospectively investigate the effects of shaving direction on PFB severity.

Electrical razors are useful in controlling PFB, maintaining beard hair at an optimum length of 0.5 to 1 mm to prevent both transfollicular and extrafollicular penetration. Triple-O electric clippers can be used in this regard. These clippers have a protective gap between the comb-like projection that touches the skin and actual razor that cuts the hair. The success of electric clippers in controlling PFB has been impressive. However, clippers leave hair that is approximately 1 mm in length, and the appearance of the remaining stubble may not be acceptable to some patients.

A foil-guarded manual razor was developed for the treatment of PFB. This razor has a single-edged, polymer-coated, stainless-steel blade with a serrated foil guard covering about 30% of its cutting edge. This guard acts as a partial buffer between the sharp blade and the skin, thus preventing hairs from being cut too close and causing transfollicular penetration. Reported results of shaving with this razor indicate improvement in most patients.

The judicious use of chemical depilatories (eg, barium sulfide powder or calcium thioglycolate cream formulations) can be a viable alternative to shaving. Barium sulfide depilatories give a smoother shave than calcium thioglycolate depilatories, but are less preferred because of malodor. However, irritant contact dermatitis and erosions are potential limitations. Prolonged contact time should be avoided to reduce the risk of irritation. A recent 1-week, split-faced, randomized trial comparing 3 depilatory formulations with shaving with a manual razor found that the depilatory compositions produced fewer papules than the manual razor, but postshaving irritation was more common with the depilatories.

Pharmacologic treatments for PFB include low-potency topical corticosteroids (eg, desonide lotion), benzoyl peroxide formulations, topical antibiotics, and topical retinoids. Topical corticosteroids can be used for more severe cases, and

### Table 1
Treatment options for pseudofolliculitis barbae (PFB) and folliculitis keloidalis nuchae (FKN)

<table>
<thead>
<tr>
<th>Pharmacologic</th>
<th>Procedural</th>
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<tbody>
<tr>
<td><strong>PFB Treatment Options</strong></td>
<td><strong>Electrolysis/epilation</strong></td>
</tr>
<tr>
<td><em>Topical retinoids</em></td>
<td><em>Potential complications: tedious; needle may not go deep enough to destroy hair bulb</em></td>
</tr>
<tr>
<td>• Keratolytic</td>
<td><em>Surgical depilation</em></td>
</tr>
<tr>
<td>• Treats concomitant PIH</td>
<td><em>Potential complications: expensive; keloid scarring in those prone to keloids in</em></td>
</tr>
<tr>
<td><strong>Low- to mid-potency topical corticosteroids</strong></td>
<td><strong>Punch excision</strong></td>
</tr>
<tr>
<td>• Anti-inflammatory</td>
<td><em>Diode</em></td>
</tr>
<tr>
<td><strong>Intralesional corticosteroids</strong></td>
<td><em>Long-pulse Nd:YAG</em></td>
</tr>
<tr>
<td>• Topical antibiotics</td>
<td><em>Potential complications: dyspigmentation, scarring, blistering</em></td>
</tr>
<tr>
<td>• Antimicrobial</td>
<td><strong>Chemical peels</strong></td>
</tr>
<tr>
<td>• Anti-inflammatory</td>
<td>1–4,8</td>
</tr>
<tr>
<td><strong>Bleaching creams for concomitant PIH</strong></td>
<td><strong>Lasers</strong></td>
</tr>
<tr>
<td>• Hydroquinone, kojic acid, azelaic acid</td>
<td>• Diode</td>
</tr>
<tr>
<td><strong>Chemical depilatories</strong></td>
<td>• Long-pulse Nd:YAG</td>
</tr>
<tr>
<td><strong>Hair growth reduction</strong></td>
<td><strong>Electrosurgical excision and secondary-intention healing</strong></td>
</tr>
<tr>
<td>• Eflornithine hydrochloride cream 13.8%</td>
<td><strong>Cryotherapy</strong></td>
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<table>
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<tr>
<th>FKN Treatment Options</th>
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<tbody>
<tr>
<td><strong>Corticosteroids (topical, intralesional), Class I or II corticosteroid gel or foam BID</strong></td>
<td><strong>Removal with trephine device and secondary-intention healing/primary closure</strong></td>
</tr>
<tr>
<td><strong>Antibiotics (oral) tetracycline derivatives or topical clindamycin for secondary infection</strong></td>
<td><strong>Excision of nodules with tissue-expansion mechanisms</strong></td>
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<tr>
<td><strong>Corticosteroid gel combined with retinoic acid gel</strong></td>
<td><strong>Laser</strong></td>
</tr>
<tr>
<td><strong>Electrosurgical excision and secondary-intention healing</strong></td>
<td><strong>Cryotherapy</strong></td>
</tr>
</tbody>
</table>

**Abbreviations:** BID, twice daily; Nd:YAG, neodymium:yttrium aluminum garnet; PIH, postinflammatory hyperpigmentation.
should generally be limited to 2-week courses or used 1 to 3 times per week to minimize risk of atrophy and other side effects. Benzoyl peroxide can be used alone or as a fixed combination with an antibiotic, and is recommended after shaving. The potential to bleach shirt collars is a possible limitation that should be conveyed to the patient. In a multicenter, double-blind, vehicle-controlled study, benzoyl peroxide 5%/clindamycin 1% gel demonstrated significant reductions in combined papule and pustule counts. Topical retinoids (tretinoin, adapalene, or tazarotene) are recommended nightly, and are useful for improving both the clinical lesions of PFB and the associated postinflammatory hyperpigmentation. Postinflammatory hyperpigmentation can be a significant sequela in PFB, and can cause as much distress to the patient as do the primary lesions of PFB. Thus, bleaching preparations including hydroquinone can also be used for secondary postinflammatory hyperpigmentation.

For cases resistant to topical therapy or for patients with PFB who prefer a longer-term clean-shaven appearance, laser hair removal is an effective option. Using lasers that are safe for the patient’s skin type is paramount, as the risk of epidermal injury is greater in higher Fitzpatrick skin phototypes (SPT). Given that epidermal melanin acts as a competing chromophore in individuals with higher SPT, longer-wavelength lasers such as the diode (800–810 nm) and neodymium:yttrium aluminum garnet (Nd:YAG 1064 nm) lasers are preferred for men of African ancestry with high SPT. The 1064-nm Nd:YAG laser has the safest profile for this patient population and therefore is strongly preferred. Combining topical efomithine hydrochloride 13.9% cream (to slow down hair growth) along with long-pulsed 1064-nm Nd:YAG laser hair removal has been shown to be more effective than laser hair removal alone.

**FOLLICULITIS KELOIDALIS NUCHAE**

**Epidemiology**

FKN, also known as acne keloidalis nuchae, is a follicular disorder primarily seen in men of African
ancestry with Afro-textured hair. However, it may rarely also be seen in women; the ratio of affected men to affected women is 20:1.28,29 In an epidemiologic study by Khumalo and colleagues,30 FKN was diagnosed in 4.7% of South African boys in the last year of school, in 10.5% of adult men, and 0.3% of adult women. In a study by Adegbidi and colleagues,31 FKN accounted for 0.7% of all dermatology consultations at a university hospital in Benin, while Salami and colleagues32 reported a prevalence of 9.4% of dermatology consultations at a Nigerian university hospital. FKN occurs in 0.5% of African Americans.33 Men often attribute the beginning of FKN to an infection from unclean barber instruments,34 although this has not been substantiated in published studies. Khumalo and colleagues30 reported an association between FKN and bleeding from haircuts. The papules of FKN may be injured during the hair-cutting process because of the force required to perform haircuts on patients with tightly coiled hair texture.35 In the setting of shared, unsterilized hair clippers, transmission of human immunodeficiency virus and other blood-borne diseases are a risk.35

Pathogenesis

The etiology of FKN remains incompletely understood.36 FKN usually occurs in men with frequent and close haircuts.37 It may also occur in women who shape the hair of the posterior neck with a razor.34 Shapero and Shapero38 hypothesized that FKN is initiated by a mechanically induced folliculitis that becomes extensive enough to result in scar formation. Based on a histopathologic study, Sperling and colleagues39 argue that FKN is a primary cicatricial alopecia that is not causally associated with ingrown hairs or bacterial infection.

Reported contributory factors to FKN include trauma, chronic irritation, seborrhea, infection, and elevated testosterone levels.34,40 Sources of mechanical irritation that may exacerbate or potentially contribute to the development FKN include friction from high-collared shirts, sports helmets, and other garments or equipment.34,38 George and colleagues40 found that 58% of Nigerian patients with FKN reported using a uniquely shaped comb, called an Afro wooden or plastic comb, frequently referred to as an Afro pick in the United States. The investigators pointed out that while using this comb, users often mechanically scrape the surface of the scalp.40

The development of FKN in a black man following an episode of zoster on the scalp has been reported.41 Keloidal plaques in patients with FKN may not develop on any other part of the body except for the occipital scalp. FKN patients, unlike patients with multiple keloids on the body, often do not have a personal or family history of keloids.34 Understanding why keloidal plaques are site restricted in FKN may provide clues to the pathogenesis of FKN and keloids.

The histology of FKN usually consists of chronic perifollicular inflammation and destruction of hair follicles.38 Features of transepithelial hair elimination similar to those found in perforating disorders, including granuloma annulare, reactive perforating collagenosis, elastosis perforans serpiginosa, and chondrodermatitis nodularis chronica helicis, have also been described.32 In a study of Nigerian patients by George and colleagues,40 the nape of the neck/occipital scalp was found to have an increased (almost double) number of mast cells compared with the anterior scalp. Moreover, dermal capillary dilation was more profound on the nape of the neck.30 The large number of mast cells in this location may contribute to a pruritic sensation prompting rubbing and manipulation of the skin.38 Genetic predisposition may also influence the density of mast cells in the scalp.38

Clinical Features

FKN is characterized by fibrotic papules on the occipital scalp, typically involving the nape of the neck (Fig. 6). Pustules and/or crusted papules can also be observed, especially when secondary infection occurs (Fig. 7). Severe secondary infections can result in abscess formation. Pruritus is common, and patients frequently admit to scratching or rubbing the affected areas. In severe or long-standing cases the papules may coalesce into a large, hairless fibrotic plaques or nodules. Tufted hairs (multiple hair shafts emerging from a single follicular opening) may also be present.1,30 FKN can be disfiguring and may adversely affect self-esteem.

Fig. 6. Folliculitis keloidalis nuchae with characteristic involvement of the posterior scalp and nape of neck.
Management

The first step in the management of FKN is initiating preventive measures to minimize disease progression or exacerbation. Such measures include avoidance of mechanical irritation from shirt collars, hats, short haircuts, and self-manipulation; and the use of topical antimicrobial cleansers (eg, chlorhexidine or povidone iodine) to prevent secondary infection.

Mild to moderate cases of FKN can be improved with the use of potent and ultrapotent topical corticosteroids. Topical therapies are generally sufficient when the papules are 3 mm or smaller and no nodules are present. To prevent atrophy and other side effects of corticosteroids, an alternating 2-week cycle (ie, 2 weeks on, 2 weeks off) of the steroid is a useful approach. In a study by Callender and colleagues, alternate 2-week cycles of clobetasol propionate 0.05% foam twice daily for 8 weeks (followed by 4 weeks of betamethasone valerate 0.12% foam twice daily if lesions persisted) demonstrated significant decreases in papule/pustule counts at week 12. Topical clindamycin gel or foam can also be used in conjunction with topical corticosteroids, especially when pustules are present. For larger papules and plaques, 20 to 40 mg/mL triamcinolone acetonide intraleSIONALLY should be added to the regimen. Oral doxycycline or minocycline are useful for extensive cases because of their anti-inflammatory and antimicrobial effects (in cases of secondary infection).

Surgical excision can be considered for severe cases of FKN that are resistant to medical therapy, especially when large (eg, ≥3 cm) fibrotic plaques or nodules are present. Recommended techniques for surgical management of FKN include excising a horizontal ellipse that involves the posterior hairline and extends to the subcutaneous fat, followed by either second-intention healing or primary closure. Excision by carbon dioxide laser and electrosurgery (followed by second-intention healing) have also been reported. Published studies with long-term follow-up are currently lacking and, therefore, there is a paucity of data on recurrence rates from surgical excision of FKN. Notwithstanding this limitation, the rates of recurrence after excision of FKN appear to be low, in contrast to those associated with keloid excisions.

Laser hair removal can be considered as an alternative or adjunct to conventional therapies. In a study of 16 patients with FKN who underwent 5 sessions of laser hair removal with the long-pulsed Nd:YAG laser, significant reductions in papule count, plaque count, and plaque size were observed.

Summary

PFB and FKN are potentially disfiguring follicular disorders that are primarily seen in men of African ancestry who have Afro-textured hair. Recent advances have brought prevention strategies and effective treatment within reach for most patients. Modification of grooming practices in combination with the appropriate use of both pharmacologic and procedural interventions is generally effective in controlling these diseases. Notwithstanding recent advances, PFB and FKN remain therapeutically challenging, relapses are common, and potential barriers to care exist (eg, limited access to laser hair removal, the need for frequent office visits, and considerable costs of treatment). Further research is warranted to better elucidate the mechanisms of disease, optimize treatment outcomes, and, ultimately, improve the quality of life of patients with these disorders.

References


